# The Ground Beetles (Coleoptera: Carabidae) of Stillfork Swamp Nature Preserve, Carroll County, Ohio[1]

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ABSTRACT. **One hundred and one species of Carabidae, including *Bembidion incrematum* LeConte, *Pterostichus caribou* Ball, *Amara lunicollis* Schiødte, *Stenolophus rotundatus* LeConte, and *Lebia moesta* LeConte, new state records, representing 32 genera were identified from light trap collections operated during 1984 and 1986-1988 in the open wetland, and from barrier pitfall traps placed in an adjacent swamp oak–hawthorn forest in 1992. Most species are hygrophilous. Species richness was highest in *Agonum* and *Bembidion*. *Pterostichus hamiltoni* Horn, *P. permundus* (Say), *Bembidion graciliforme* Hayward were the most abundant species collected by pitfall traps and *Stenolophus ochropezus* (Say), *Agonum tenue* (LeConte) and *Clivina impressefrons* LeConte were the most abundant in light trap collections. Differences in the number and abundance of species collected by light traps and pitfalls suggest both methods be used to survey wetlands.**

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## INTRODUCTION

Recent publications have documented the occurrence of at least 462 species of Carabidae in Ohio. Most surveys of carabids have been conducted in forest (Purrington and Stanton, 1996; MacLean and Usis 1992, Purrington and others 1989) or agricultural ecosystems (for example, Allen 1979). Will and others (1995) reported 241 species representing 63 genera from islands of the western Lake Erie Basin and the adjacent Canadian and US mainland. Relatively few studies have been carried out on the ground beetles of Ohio wetlands. Williams and others (1995, 1996) listed 85 species of Carabidae (exclusive of tiger beetles) in a survey of insects from Killbuck Marsh Wildlife Area of Wayne and Holmes counties, OH.

The purpose of this study was to survey the carabid beetles of Stillfork Swamp Nature Preserve, an unglaciated wetland owned by The Nature Conservancy 9 km northeast of Carrollton in Carroll County, OH (Stein 1974). The preserve supports disjunct populations of more northern species of plants and animals (Buchanan 1980; Stein 1974). Habitats within Stillfork swamp included seasonally wet meadows, marsh, and forest. County Road 10 and Still Fork Creek are bordered by a riparian forest dominated by *Quercus bicolor* Willd. and *Crataegus* sp. Still Fork Creek typically overflows its banks in November, flooding much of the swamp from fall to late spring. Except for periods of heavy rainfall, wooded riparian and clay bank habitats along Still Fork Creek, as well as wet meadow, marsh, and littoral habitats, are relatively dry from July to early November. Seasonal flooding of habitats adjacent to Still Fork Creek creates conditions for carabids that are much different from those of better drained upland sites.

## MATERIALS AND METHODS

Ground beetles were collected during the late spring, summer, and fall of 1984, 1986, 1987, and 1988 by means of three 8-watt ultraviolet light traps operated in the open wetland approximately 250 m east of where Carroll County Road 10 crosses Still Fork Creek. A map of the site is presented in Usis and MacLean (1986). Beetles were collected during the same period in 1992 by means of 5 barrier pitfall traps placed in a swamp white oak woods located adjacent to the creek and open wetland. Traps were placed along a transect (100 m) from approximately the center of the woods to the bank of Still Fork Creek. Each pitfall trap consisted of 2 plastic cups (17 cm diameter) dug into soil to a depth of about 18 cm and filled with 150 ml of 10% formalin as preservative. A Vigilas™ barrier (20 x 90 cm) was placed between the two traps (Reeves 1980). Traps were emptied and recharged approximately weekly. Each collection sample consisted of the organisms caught at both ends of the barrier pitfall trap. Samples were washed in 80% ethanol, and pinned. Voucher specimens are retained at Youngstown State University, Department of Biological Sciences insect collection.

## RESULTS AND DISCUSSION

We obtained 101 species of Carabidae, representing 15 tribes and 32 genera, at Stillfork Swamp Nature Preserve (Table 1). *Bembidion incrematum* LeConte, *Pterostichus caribou* Ball, *Amara lunicollis* Schiødte, *Stenolophus rotundatus* LeConte, and *Lebia moesta* LeConte represent new state records. *Pterostichus caribou* is a new record for the lower 48 United States. It is recorded from Alaska, Yukon Territories, Northern Territories, Manitoba and thus is a very anomalous capture representing an extremely disjunct population. Its inclusion should remain tentative pending additional specimens. Based on literature records and specimens checked, the percentages of macropterous, dimorphic, or brachypterous species were 89.4, 5.3, and 5.3%, respectively.

According to Lindroth (1961-1969), nearly half of the species we collected preferred hygrophilous or very hygrophilous sites (sandy or organic soil at the margins of pools near rich marsh vegetation), followed by xerophilous (sandy or gravelly soil in dry open sites with

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TABLE 1

*List of ground beetles collected by light trap (L) (1984, 1986, 1987, 1988) and/or pitfall trap (P) (1992) from Stillfork Swamp, Carroll County, OH.*

| Tribe[a]/Species | No./Method | | Wing[b] | Habitat[c] |
|---|---|---|---|---|
| Notiophilini | | | | |
| *Notiophilus aeneus* (Herbst) | 4 | P | m | mes |
| *N. semistriatus* Say | 2 | P | d | xer |
| Loricerini | | | | |
| *Loricera pilicornis* (F.) | 11 | P | m | hyg |
| Clivinini | | | | |
| *Dyschirius sphaericollis* (Say) | 1 | L | M | xer |
| *Clivina americana* Dejean | 5 | L | M | hyg |
| *C. hipustulata* (F.) | 23 | L (22), P (1) | M | n/a |
| *C. impressefrons* LeConte | 111 | L (110), P (1) | M | rbnk |
| Bembidiini | | | | |
| *Elaphropus saturatus* (Casey) | 1 | L | M | rbnk |
| *Paratachys oblitus* (Casey) | 1 | L | M | n/a |
| *P. proximus* (Say) | 31 | L | M | hyg |
| *P. scitulus* (LeConte) | 14 | L | M | |
| *Bembidion affine* Say | 8 | L (5), P (3) | M | hyg |
| *B. castor* Lindroth | 2 | L | | |
| *B. cordatum* (LeConte) | 2 | L | M | hyg |
| *B. frontale* (LeConte) | 6 | P | m | hyg |
| *B. graciliforme* Hayward | 148 | P | | |
| *B. honestum* Say | 1 | L | M | xer |
| *B. impotens* Casey | 60 | L | | |
| **B. incrematum* LeConte | 1 | L | M | hyg |
| *B. patruele* Dejean | 80 | L (79), P (1) | M | hyg |
| *B. rapidum* (LeConte) | 5 | L | M | rbnk |
| *B. versicolor* (LeConte) | 7 | L | | |
| Pterostichini | | | | |
| *Poecilus lucublandus* (Say) | 138 | P | m | xer, opn |
| *Lophoglossus scrutator* (LeConte) | 13 | P | m | hyg |
| **Pterostichus caribou* Ball | 1 | P | b | |
| *P. caudicalis* (Say) | 3 | P | m | hyg |
| *P. commutabilis* (Motschulsky) | 4 | P | m | xer, opn |
| *P. corvinus* (Dejean) | 2 | P | m | hyg |
| *P. femoralis* (Kirby) | 4 | P | d | opn |
| *P. hamiltoni* G. H. Horn | 398 | P | m | n/a |
| *P. melanarius* (Illiger) | 2 | P | d | opn |
| *P. permundus* (Say) | 160 | P | m | n/a |
| *P. stygicus* (Say) | 142 | P | b | mes, opn |
| Zabrini | | | | |
| *Amara apricaria* (Paykull) | 1 | P | | |
| *A. cupreolata* Putzeys | 5 | P | m | xer |
| *A. latior* (Kirby) | 1 | L | M | xer |
| **A. lunicollis* Schiødte | 1 | P | | |
| *A. pennsylvanica* Hayward | 1 | P | m | mes |
| Oodini | | | | |
| *Oodes brevis* Lindroth | 1 | P | m | hyg |
| Chlaeniini | | | | |
| *Chlaenius emarginatus* Say | 2 | P | m | mes |
| *C. impunctifrons* Say | 80 | P | m | hyg |
| *C. nemoralis* Say | 1 | L | M | rbnk |
| *C. pennsylvanicus* Say | 31 | L (18), P (13) | M | hyg |
| *C. sericeus* (Forster) | 1 | P | m | hyg |
| Licinini | | | | |
| *Diplocheila assimilis* (LeConte) | 1 | L | M | hyg |
| *D. striatopunctata* (LeConte) | 2 | L | M | hyg |
| *Dicaelus sculptilis intricatus* LeConte | 3 | P | b | n/a |
| *Badister neopulchellus* Lindroth | 33 | L | M | hyg |
| *B. ocularis* Casey | 4 | L | M | hyg |
| *B. transversus* Casey | 3 | L | M | n/a |

TABLE 1 (*Cont.*)

| | | | | |
|---|---|---|---|---|
| Harpalini | | | | |
| *Anisodactylus discoideus* Dejean | 3 | L | M | xer |
| *A. sanctaecrucis* (F.) | | | | |
| *Amphasia interstitialis* (Say) | 25 | P | m | mes, opn |
| *A. sericea* (T. W. Harris) | 60 | L | M | opn |
| *Stenolophus comma* (F.) | 37 | L | M | opn |
| *S. fuliginosus* Dejean | 6 | L | M | hyg |
| *S. lecontei* (Chaudoir) | 31 | L | M | hyg |
| *S. ochropezus* (Say) | 3000+ | L (3000+), P (1) | M | hyg |
| **S. rotundatus* LeConte | 1 | P | | |
| *Bradycellus nigriceps* LeConte | 1 | P | | |
| *B. tantillus* (Dejean) | 5 | L | M | n/a |
| *Acupalpus carus* (LeConte) | 13 | L | M | hyg |
| *A. partiarius* (Say) | 8 | L | | |
| *Harpalus compar* LeConte | 63 | P | m | opn |
| *H. erythropus* Dejean | 5 | L | M | opn, xer |
| *H. faunus* Say | 4 | P | m | xer |
| *H. fulgens* Csiki | 2 | P | m | n/a |
| *H. pensylvanicus* (DeGeer) | 71 | L (70), P(1) | M | opn, xer |
| *H. somnulentus* Dejean | 7 | P | m | opn |
| *Trichotichnus dichrous* (Dejean) | 5 | L | M | opn |
| *T. vulpeculus* (Say) | 2 | P | m | n/a |
| Platynini | | | | |
| *Oxypselaphus pusillus* (LeConte) | 19 | P | b | hyg |
| *Platynus cincticollis* (Say) | 8 | L | M | mes |
| *P. hypolithos* (Say) | 86 | P | b | mes |
| *Agonum aeruginosum* Dejean | 17 | L | | |
| *A. collare* (Say) | 12 | L | M | n/a |
| *A. decorum* (Say) | 1 | L | M | hyg |
| *A. ferreum* Haldeman | 18 | P | m | mes |
| *A. galvestonicum* (Casey) | 12 | L | M | hyg, plnt |
| *A. gratiosum* (Mannerheim) | 2 | L (1), P (1) | | |
| *A. lutulentum* (LeConte) | 31 | L | M | hyg |
| *A. melanarium* Dejean | 142 | P | m | hyg |
| *A. placidum* (Say) | 1 | L | M | xer |
| *A. palustre* Goulet | 8 | P | m | hyg |
| A. punctiforme (Say) | 39 | P | m | opn |
| *A. tenue* (LeConte) | 131 | L | M | hyg |
| *A. thoreyi* Dejean | 69 | L (64), P (5) | M | hyg |
| Odacanthini | | | | |
| *Colliuris pensylvanica* (L.) | 8 | L | M | opn, xer |
| Ctenodactylini | | | | |
| *Leptotrachelus dorsalis* (F.) | 3 | L | M | hyg |
| Lebiini | | | | |
| *Cymindis cribricollis* Dejean | 1 | P | d | xer |
| *C. limbatus* Dejean | 1 | L | M | plnt |
| *Lebia analis* Dejean | 11 | L | M | n/a |
| *L. atriventris* Say | 13 | L | M | |
| *L. fuscata* Dejean | 3 | L | M | n/a |
| *L. grandis* Hentz | 3 | L | M | |
| *L. lobulata* LeConte | 8 | L | M | n/a |
| **L. moesta* LeConte | 1 | L | M | plnt |
| *L. solea* Hentz | 7 | L | M | plnt |
| *L. tricolor* Say | 2 | L | M | plnt |
| *L. viridis* Say | 79 | L | M | plnt |
| Galeritini | | | | |
| *Galerita bicolor* (Drury) | 2 | L | M | n/a |

[a] Bousquet and Larochelle (1993)

[b] Wing and flight capability from light trap results or Lindroth (1961-69), Will and others. (1995), Purrington and others (1989): b = brachypterous; d = dimorphic; M = macropterous, capable of flight, m = macropterous, specimens checked or literature referenced, flight unknown.

[c] Ground beetle microhabitats [Lindroth (1961-69)]: hyg = hygrophilous, mes = mesic, opn = open grassy areas, n/a = not available, plnt = planticolous, rbnk = river bank, xer = xerophilous.

* New record for state.

sparse vegetation), river banks, open grassy areas, mesic deciduous woods, and above ground vegetation (for example, planticolous). While terms used to describe ground beetle habitats are useful, they do not always describe the same soil and vegetation characteristics. For example, species described as hygrophilous may inhabit sites with different soils and vegetation. Hygrophilous species such as *Agonum melanarium*, *A. lutulentum*, *A. thoreyi*, *Badister ocularis*, *Bembidion frontale*, and *Pterostichus corvinus*, typically inhabit the margins of standing water that support dense vegetation of *Carex*, *Eleocharis*, *Salix*, *Solanum*, and *Typha*. However, *Bembidion incrematum*, *B. patruele*, and *B. versicolor* occur near the margins of standing water where vegetation is sparse or absent. The association of fossil insects, including ground beetles, with soil and vegetative characteristics has been used to infer paleoenvironments and climates (Morgan and Morgan 1979, Schwert and others 1985).

The numbers of uncommon, common, and abundant carabid species collected by light traps and pitfall traps are presented in Figure 1. The use of pitfall as well as light traps allowed us to sample carabids inhabiting both marsh and forest habitats increasing the number of species known to inhabit the preserve. The number of species collected by light traps located in open marsh and pitfalls in forest habitats reflected differences in carabid habitat preferences, flight capabilities, and the number of years sampled. Although operated for only one year (1992), pitfall traps yielded more abundant species than did light traps. The small overlap number of species (9) collected by both light traps and pitfalls appeared to be due more to habitat preference than flight capability. Of the 60 species of carabids collected by light traps, only nine were also collected by pitfall traps (Table 1). The most abundant species collected in light traps were: *Stenolophus ochropezus*, *Agonum tenue*, and *Clivina impressefrons*. Of the 49 species collected by pitfall traps, including five abundant species (*Pterostichus hamiltoni*, *P. permundus*, *P. stygicus*, *Bembidion graciliforme*, *Agonum melanarium*) only 9 were brachypterous or dimorphic (Table 1). Thus the majority of carabids inhabiting the adjacent forest were apparently capable of flight. Their absence from light trap collections reflected habitat preferences of carabids in open wetlands and adjacent forests.

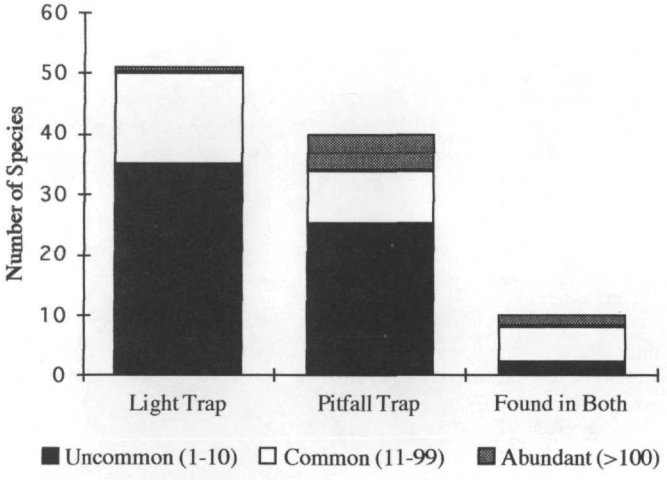


FIGURE 1. Collection method comparison by species richness and abundance.

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